

COMPOSITION OF COEXTRUDED ADHESIVE FILM TO BOND NON-POLAR TO POLAR SURFACES

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The invention relates to the composition of a coextruded adhesive film used to bond non-polar to polar materials.

2. Description of the Prior Art

10 The process of bonding a non-polar surface such as Styrene-butadiene-rubber (SBR) or Ethylene Vinyl Acetate (EVA) to a polar surface such as PVC, polyurethane or polyester almost always involves the use of surface modification such as the use of a primer for one or both surfaces or corona treatment of the non-polar surface prior to applying an adhesive such as a urethane-based adhesive. Whether the urethane is applied as a liquid or a film, the
15 primers used are either solvent or water based that either emit hazardous materials into the atmosphere or require energy to dry. The treatments are fugitive, they have limited shelf life and are easily rendered useless by surface contamination.

BRIEF SUMMARY OF THE INVENTION

Broadly, the invention comprises a thermoplastic urethane (TPU) adhesive film having
20 a functionalized ethylene copolymer adhesive film bonded thereto. The two adhesive films are

preferably coextruded to form a coextrudate. The coextrudate can bond a non-polar material such as Styrene-butadiene-rubber (SBR) or Ethylene Vinyl Acetate (EVA) to a polar surface such as PVC, polyurethane or polyester. The ethylene copolymer can bond to the non-polar material while the thermoplastic polyurethane can bond to the polar material.

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BRIEF DESCRIPTION OF THE DRAWING(S)

Fig 1 is an illustration of a coextrudate of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

10 In the present invention, one layer of the adhesive is preferably an ethylene copolymer-based adhesive and the other layer a thermoplastic polyurethane-based adhesive. The ethylene copolymer-based adhesive layer can bond to a non-polar material such as Styrene-butadiene-rubber (SBR) or Ethylene Vinyl Acetate (EVA). The thermoplastic polyurethane-based adhesive layer can bond to a polar material such as PVC, polyurethane or polyester. The
15 adhesive layers may be applied singly or as a coextrusion by nip roller, lamination, spraying as film, etc.

Example:

A thermoplastic polyurethane adhesive, e.g.: Irogran® CA116 from Huntsman West Deptford, NJ is coextruded in a thickness of between about 0.0005" to 0.005" with an anhydride modified ethylene vinyl acetate, e.g.: Bynel® Series 3800 from DuPont, 5 Wilmington, DE, and specifically Bynel® E418, or Fusabond®C Series, specifically MC 190D, DuPont, Wilmington, DE in a thickness of between 0.0005" to 0.05" and coextruded to form a two-layer film.

Either of these coextruded films can be used to bond a non-polar untreated EVA surface to a polar surface such as PVC and give adhesion strength in excess of 20 pounds per linear 10 inch. Without the abovementioned films, in order to achieve similar level of adhesion, the Phylon surface must be treated with a primer prior to bonding with a urethane adhesive to the PVC.

As shown in Fig 1, the coextrudate 10 comprises a thermoplastic polyurethane layer 12 and an anhydride modified ethylene vinyl acetate layer 14.

15 Adhesives include the following extrudate combinations: acid modified ethylene vinyl acetate/ester-based thermoplastic polyurethane; acid modified acrylic acetate/ester-based thermoplastic polyurethane or acrylic modified polyurethane; acrylic or acid modified ethylene copolymer ester-based polyurethane or polyester; acrylic or acid modified polyolefins/ester-based polyurethane or acrylate-modified polyurethane or polyester. Some examples include 20 PVC, Polyvinylidene chloride, Polyvinylidene fluoride, Tedlar® (Polyvinylfluoride) from DuPont, Wilmington, DE, Pebax® (Polyether amide) from Ato-Fina, Puteaux, France, epoxy,

polyurethane, polyamide or polyester. Specifically, the following non polar material/adhesive layer 14/adhesive layer 12/polar material combinations are believed to be suitable for purposes of the invention.

| | <u>Non-polar Material</u> | <u>Adhesive Layer 14</u> | <u>Adhesive Layer 12</u> | <u>Polar Material</u> |
|----|---------------------------|--|--------------------------|---------------------------------------|
| 5 | EVA | acid or anhydride modified polyolefins | ester-based TPU | Polyurethane |
| | EVA | acid modified acrylic | ester-based TPU | polyurethane |
| 10 | EPDM | acid or anhydride modified polyolefins | ester-based TPU | PVC |
| 15 | SBR | modified EVA | Urethane | polyurethane, acrylates or polyesters |
| | Natural Rubber | modified EVA | ester-based TPU | Polyurethane |

20 Although described reference to specific thermoplastic polyurethane adhesives and ethylene copolymer based adhesives, other suitable adhesives include thermoplastic polyurethane blends and polyesters and polyamides.

The foregoing description has been limited to a specific embodiment of the invention. It will be apparent, however, that variations and modifications can be made to the invention, 25 with the attainment of some or all of the advantages of the invention. Therefore, it is the object of the appended claims to cover all such variations and modifications as come within the true spirit and scope of the invention.

Having described my invention, what I now claim is: